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Jameco Part Number 199646

LCD Message 2 (LCD MSG 2) & IRDA Daughter Board

User's Manual

INTRODUCTION

The LCD Message Module 2 (MSG2) is a simple-to-use, complete LCD display messaging system that provides the user the ability to display custom messages on a standard LCD module without the necessity of a host computer or provide direct serial communication with the LCD module. Each MSG2 module contains its own embedded processor and non-volatile, re-programmable message storage limited only by the size of available memory. The messages are programmed into the MSG2 using a standard 9600 bps serial port connection to a PC running a user-friendly Windows software application, or the option of an IRDA infrared downlink via Laptop or handheld Palm computer.

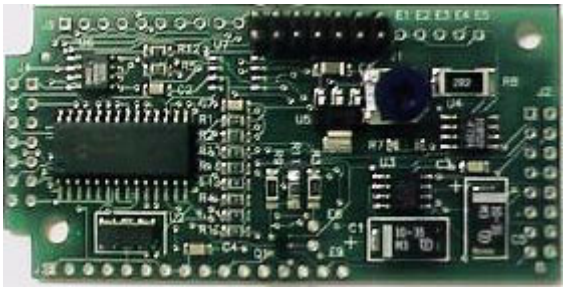


Figure 1 LCD MSG2 (actual size)

The MSG2 can be mated with an LCD module using a 1x16 (J3), a 2x7 (J4), or a 2x8 (J2) connector, depending on the module type. An in-line connector/header can be used to provide an easy means of separating the two modules. The MSG2 may also be permanently installed if desired. *(Note: a square pad on the printed wiring board denotes Pin 1).*

GETTING STARTED

Connecting to a PC

To program the messages into the MSG2, an RS-232 serial cable (optional) must be connected from the module to the PC using one of the wiring diagrams shown in the back of this manual:

MSG2 Program Modes

The user should decide on which one of the four available mode the MSG2 should operate. All modes are available and can be selected and reselected by downloading to the MSG2. There are 4 basic modes provided by the LCD Message 2 module. They are as follows:

- **Pass-Through Mode (Terminal)**
- **4 Switch Mode (16 unique messages)**
- **Up/Down Mode (Up/Down Push Button)**
- **Auto Sequence Mode (Sequence through the stored messages)**

Pass-Through Mode

In this mode the MSG2 acts like a dumb terminal, interrupting the ASCII characters as they are received. This mode provides the ultimate in flexibility to control the LCD display when connected to a terminal or host computer, by providing direct serial communication with the LCD controller. All printable characters are passed directly through to the LCD display. In addition, escape sequences allows sending any data code or control code to the LCD controller IC.

There are also single-byte commands, which allow the user to easily configure the display features (i.e., Cursor, Underline, Scroll).

4 Switch Mode

This mode provides direct selection of up to 16 messages using 4 line inputs. The current state of the 4 lines (either shorted to ground or left open) immediately selects the displayed message. IRDA interface connector J5 is used to interface with the optional IRDA daughter board.

The four switch inputs should be connected in some fashion (e.g., switch closure or open-collector transistor output) to allow each input to be either shorted to ground (< 0.4Vdc) or left open (internal pull-up resistors are used so the inputs do not float). Messages are selected according to the inversion of the binary decode of the switch inputs, as shown in Table 5. Note that if 8 or fewer messages are stored, SW4 may be omitted. Similarly, for 4 or less messages, SW3 may be omitted.

Table 5: Switch Input Decoding (4 switch mode)

Switch Value (SW4:SW1)	Corresponding Displayed Message Number
1111	Message #0 (all 4 switch inputs open)
1110	Message #1
1101	Message #2
1100	Message #3
1011	Message #4
1010	Message #5
1001	Message #6
1000	Message #7
0111	Message #8
0110	Message #9
0101	Message #10
0100	Message #11
0011	Message #12
0010	Message #13
0001	Message #14
0000	Message #15 (all 4 switch inputs connected to Ground)

Up/Down Mode

This mode provides the selection of any message in memory via two (2) user supplied pushbutton switches (up and down). At power-on, the first message is displayed.

Auto Sequence Mode

This mode allows the creation of a multi-message sequence to be programmed into the LCD Message 2 module. Each message has a programmable time delay before displaying the next message in the sequence. This sequence is free running, and starts at power-on displaying the first message in the sequence list. When the last message in the list has been displayed, the sequence restarts with the first message.

INSTALLING THE PROGRAMMING SOFTWARE

To install the MSG2 programming application on a Personal Computer, execute the program "setup.exe" on the provided disk. This program will prompt you for the desired installation directory, and automatically install the necessary Windows drivers it requires.

Note: Minimum Requirements for the PC host include the following: 4Mbytes available RAM, 4 Mbytes available disk space, Win95/Win98, or Windows NT/2000 operating system, with an available serial port capable of running at 9600 bps.

Initialization & Programming

The MSG2 comes configured for the Pass-Through mode of operation. With power connected and a user-supplied serial link to a host computer, the MSG2 is ready to receive commands.

The MSG2 must be configured via the PC-based program for the remaining modes: 1-of-16 select, up/down, and auto-sequence. Once configured, the selected mode and messages are saved in non-volatile memory and the MSG2 will be operating in the selected mode every time it powers-up. The selected mode may be changed by downloading a new setup. Downloading of the messages and operating mode involves connecting the MSG2 to a serial COM port on a host computer and running the MSG2 Windows-based software. To begin the programming sequence, connect the module's XMT, RCV, and ground signals as described at the end of this manual to an RS-232 cable connected to a PC. Next, start the Windows GUI interface by invoking the "LcdMsg2.exe". When invoked, the program will display the MSG2 application shell.

Begin by selecting the desired mode for the LCD Message 2 module. Based on the mode selected, additional entry fields will be enabled.

Pass-Thru Mode:

At power-on, the first communication with the MSG2 module needs to be configuring the display type (number of characters and lines). Following this, typically, is setting the cursor style. By default, the cursor is an underline. Text can then be displayed by sending printable characters. Table 6 contains a list of 2-byte escape sequences which allow sending any byte value, printable or not, to either the Data Register or Control Register of the LCD controller. Note that sequences FC and FD are useful for large displays (greater than 80 total characters) which employ 2 controller ICs. If escape-sequence bytes FE or FF are sent to a 2-controller display, only the controller, which has the active cursor, receives the second byte of the sequence.

Table 6: Escape Sequences in Pass-Through Mode

First Byte	Second Byte	Function
FF	XX	Sends byte XX to the Control Register of the LCD controller.
FE	XX	Sends byte XX to the Data Register of the LCD controller.
FD	XX	Sends byte XX to the Control Register of both LCD controllers.
FC	XX	Sends byte XX to the Data Register of both LCD controllers.

Table 7: 1-Byte Control Characters in Pass-Through Mode

Byte Value	Control-Char equivalent	Function
01	^A	Clear Display
02	^B	Cursor = Blanked
03	^C	Ignored
04	^D	Configure Display Type (see table 8)
05	^E	Display user-definable character #5
06	^F	Display user-definable character #6
07	^G	Display user-definable character #7
08	^H	Backspace
09	^I	Forward
0A	^J	Line Feed
0B	^K	Cursor Up
0C	^L	Clear Display
0D	^M	Carriage Return
0E	^N	Cursor = Blanked (same as ^B)
0F	^O	Cursor = Block (blinking)
10	^P	Cursor Home
11	^Q	Cursor = Underline
12	^R	Cursor = Underline and blinking block
13	^S	Display Off
14	^T	Select 5x10 Font (descenders)
15	^U	Select 5x7 Font (no descenders)
16	^V	Ignored
17	^W	Select multi-line display
18	^X	Select single-line display
19-1F	^Y, ^Z, etc.	Ignored

When sending the byte Control-D (^D) to the MSG2 module, the next byte is interpreted as the Display Type. Table 8 contains the list of characters that specify the display type.

Table 8: Display Configuration Codes in Pass-Through Mode

Configuration Character	Display Format (Number of Lines / Characters)
A	1 x 8
B	1 x 16 (see note 1, below)
C	1 x 20
D	1 x 24
E	1 x 32
F	1 x 40
G	1 x 80
H	2 x 8
I	2 x 16
J	2 x 20
K	2 x 24
L	2 x 32
M	2 x 40
N	2 x 80
O	4 x 8
P	4 x 16
Q	4 x 20
R	4 x 24
S	4 x 32
T	4 x 40

Note 1: Use type 'B' for displays that employ 2 ICs: 1 controller and 1 driver. If using a 1x16 display which has only 1 IC (no driver IC), use type 'H' instead.

16 Position Switch Select Mode:

This mode provides the operator to enter up to 16 messages for display. Enter the desired messages by first clicking the 'Add Msg' button. Then select the new message number in the message number window. A default message will appear in the message window. Edit this message as desired. The user may select any message number in the message list window to edit that message. Don't forget to save your work.

Up/Down Mode:

This mode provides the operator the ability to enter any number of messages, limited only by available memory, which will be selectable by scrolling through the messages via 'up/down' switches. Messages are saved in the MSG2 module using the same procedure as described in the 16 Position Switch Select Mode.

Auto-Sequence Mode:

This mode provides the capability to automatically display a set of messages in sequence, with an individually selectable time delay (duration) of each message. The number of messages is limited only by available memory. Begin by selecting 'Auto-Sequence' mode using the mode select radio buttons. Enter the desired message using the same method as described in the previous paragraphs. With each message, enter a numerical value for the time delay. This time delay is the duration in one-second increments, and has an upper limit of 255 seconds. After the messages have been entered, enter the message sequence. The sequence is described by entering the message numbers, **separated by spaces**, into the auto sequence field. Don't forget to save your work.

WINDOWS APPLICATION SOFTWARE

Programming Procedure:

The windows application software provide the User with a simple interface to allow mode selection and a method for creating messages for display. The LCD type combo list allow the user to select the particular display format (i.e., 1x8 to 4x40). Selecting a display format launches an additional window that simulates the actual display in a "what you see is what you get (WYSIWYG)" arrangement. Due to the nature of the display character wrapping the text box of type does not understand the carriage return linefeed to get to the next row, so the user should insert space characters; watching the simulation window to determine the correct placement of characters on a multi-line display.

Connect the LCD Message 2 module to the host computer via the RS232 connection. Power the module. Begin the PC application software. If the host computer is not using COM1, change the com port setting in the program by clicking on the system menu (the icon in the upper left corner of the window). Then select the proper com port. If loading or modifying a previous message set, click the "Load…" button, and locate the previously saved file. Otherwise, develop the messages as described above. When the messages are fully defined, save them to disk by clicking the "Save…" button, and entering a suitable file name. Finally, click the "Download…" button. The Progress Bar along the bottom of the window will show the data transaction's percentage complete.

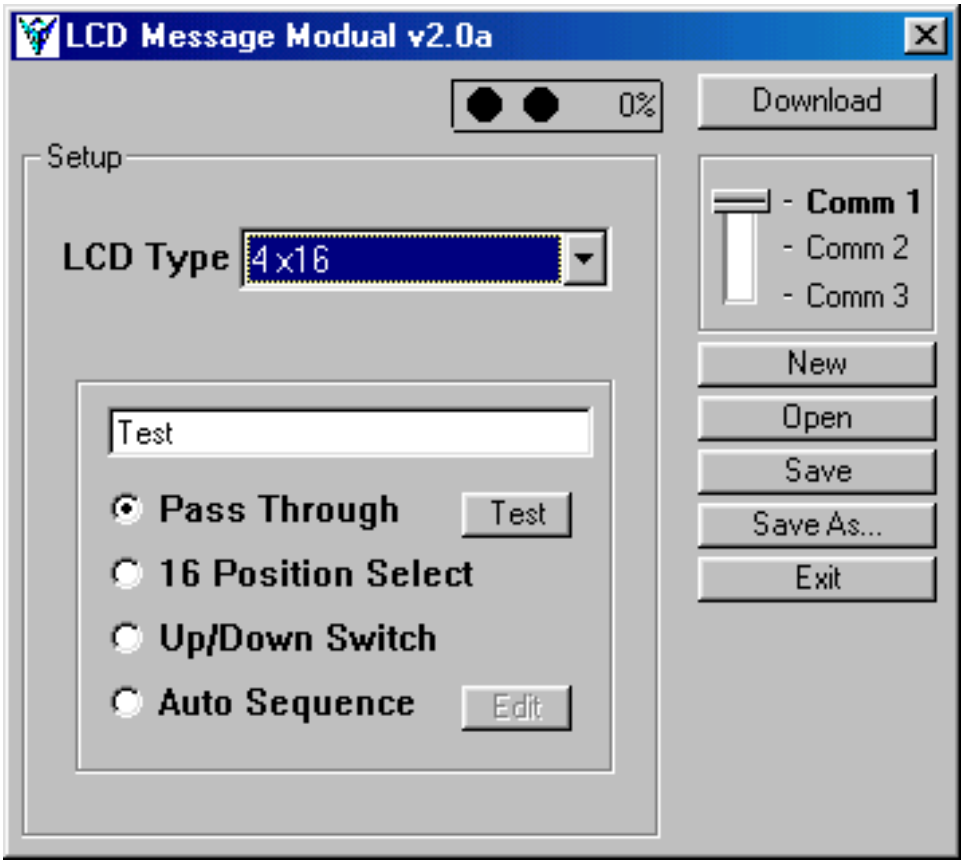


Figure 2. Window Application

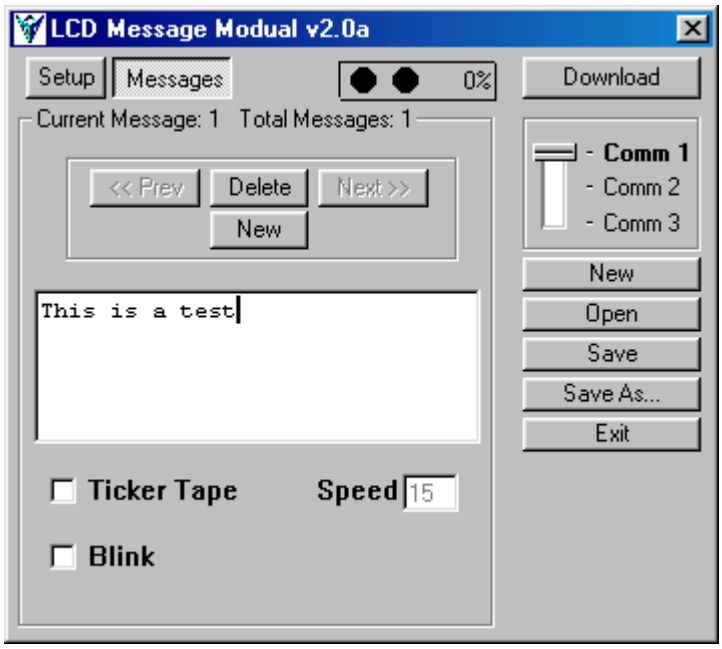


Figure 3. Window Application, Message Editor

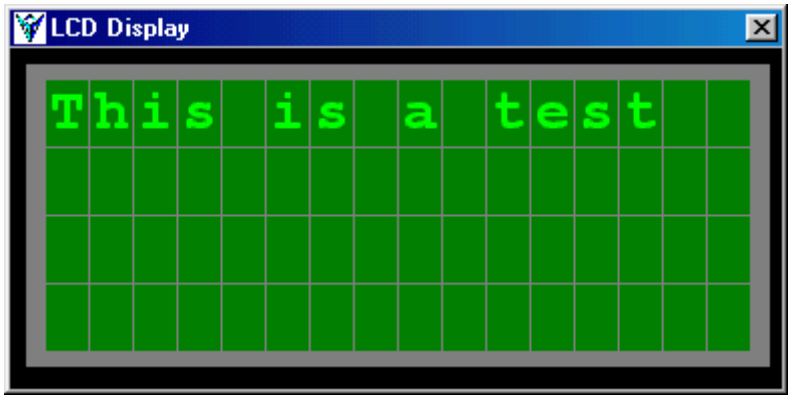
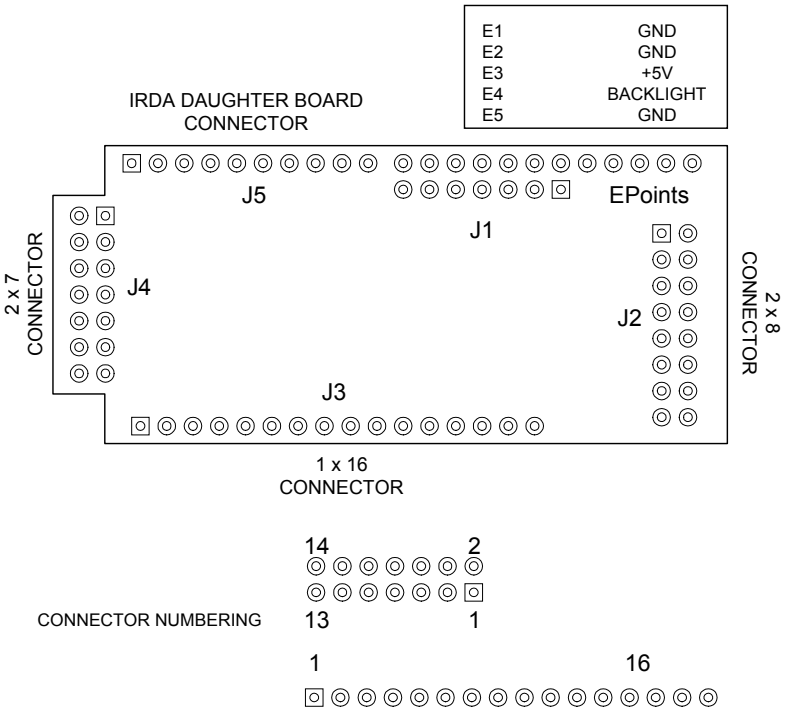


Figure 4. Windows Application, LCD Simulator

The LCD Message 2 is now ready to use. When power is turned off and re-applied the MSG2 will execute the display mode programmed.

MSG CONNECTORS



LCD MSG 2 Connector Locations

Note: Do not use pins 15 and 16 of J3 for backlight connection. E-points E4 and E5 should be used for backlight.

CONNECTION SETUP

J1 is a 14-pin header that provides the MSG module with connections to Power (+6Vdc to +15V), Ground, RS-232 Serial Input, and four Switch Inputs. The pin assignments for J1 are specified in Table 1 as follows:

Table 1: Connector J1, 14-pin header connector, RS-232, Switch, & Power Interfaces

Pin Number	Description
1	+6V Power Supply (+6to+15V). This pin connects to the external +6V supply.
2	Reserved
3	Digital Ground (DGND). This pin connects to the 6V supply ground, and should also be connected to the RS-232 shield ground external to the MSG module.
4	Alert. This is an open-collector output, connected to ground when activated.
5	Reserved
6	Serial Output or Transmit (TXD). This pin connects to the RX line of the RS-232 connection.
7	Serial Input or Receive (RXD). This pin connects to the TX

	line of the RS-232 connection.
8	Digital Ground (DGND)
9	Reserved
10	Reserved
11	Switch Input 1 (SW1). This pin connects to external switch #1. It is pulled-up internally to +5V through a 10K Ohm resistor. This is also the UP switch when in Up/Down mode.
12	Switch Input 2 (SW2). This pin connects to external switch #2. It is pulled-up internally to +5V through a 10K Ohm resistor. This is also the DOWN switch when in Up/Down mode.
13	Switch Input 3 (SW3). This pin connects to external switch #3. It is pulled-up internally to +5V through a 10K Ohm resistor.
14	Switch Input 4 (SW4). This pin connects to external switch #4. It is pulled-up internally to +5V through a 10K Ohm resistor.

Table 2: Connector J2, 16-pin (2 x 8) header connector, LCD Interface

Pin Number	Description
1	D7
2	D6
3	D5
4	D4
5	D3 (Grounded)
6	D2 (Grounded)
7	D1 (Grounded)
8	D0 (Grounded)
9	E (to Controller #1)
10	-WE (Grounded)
11	R/S Select
12	LCD Bias voltage
13	Ground
14	+5 Volts
15	E (to Controller #2, for displays with more than 80 total characters)
16	N/C

Table 3: Connector J3, 16-pin (1 x 16) header connector, LCD Interface

Pin Number	Description
1	Ground
2	+5 Volts
3	LCD Bias voltage
4	R/S select
5	-WE (Grounded)
6	E (to Controller #1)
7	D0 (Grounded)
8	D1 (Grounded)
9	D2 (Grounded)
10	D3 (Grounded)
11	D4
12	D5
13	D6
14	D7
15	E (to Controller #2, for displays with more than 80 total characters)
16	N/C

Table 4: Connector J4, 14-pin (2 x 7) header connector, LCD Interface

Pin Number	Description
1	Ground
2	+5 Volts
3	LCD Bias voltage
4	R/S Select
5	-WE (Grounded)
6	E (Enable pulse)
7	D0 (Grounded)
8	D1 (Grounded)
9	D2 (Grounded)
10	D3 (Grounded)
11	D4
12	D5
13	D6
14	D7

Note: Connector J4 can not be used for 2-controller displays (those with more than 80 characters).

RS-232 PORT SETTINGS AND CONNECTION

The MSG2 operates with the following RS-232 port parameters:
Baud rate = 9600 bps, 8 bits per character, one stop bit, and no parity bits, with no handshaking

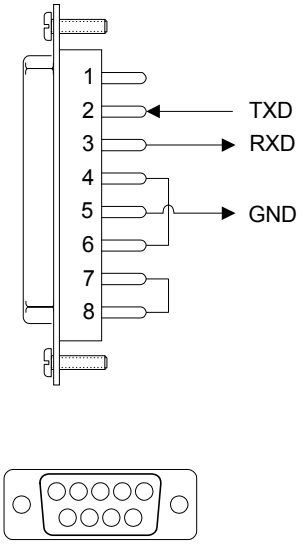
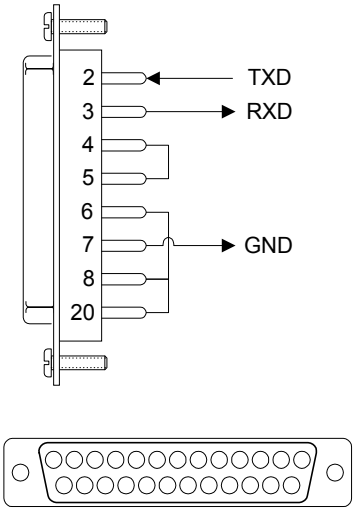


Figure 5: DB-9 (9-pin) COM Connector Wiring:

Connections	Signal Names
Pin 2	TXD (data from the MSG)
Pin 3	RXD (data to the MSG)
Pin 5	GND
Pin 4 to Pin 6	DTR to DSR
Pin 7 to Pin 8	RTS to CTS

Figure 6: DB25 (25pin) COM Connector Wiring:



Connections	Signal Names
Pin 2	TXD (data from the MSG)
Pin 3	RXD (data to the MSG)
Pin 7	GND
Pin 4 to Pin 5	RTS to CTS
Pin 6 to Pin 20 to Pin 8	DSR to DTR to DCD

RS-232 Signal Name Acronyms:

CTS	*Clear to Send*
DCD	*Data Carrier Detect*
DSR	*Data Set Ready*
DTR	*Data Terminal Ready*
GND	*Signal Ground*
TXD	*Transmit Data*
RXD	*Receive Data*
RTS	Request to Send

Note: If these connections are not properly made, the MSG module cannot be programmed with new messages.

MSG MODULE SPECIFICATIONS:

Available memory for messages (non-volatile):
Type 873: 2500 characters
Type 876: 6600 characters

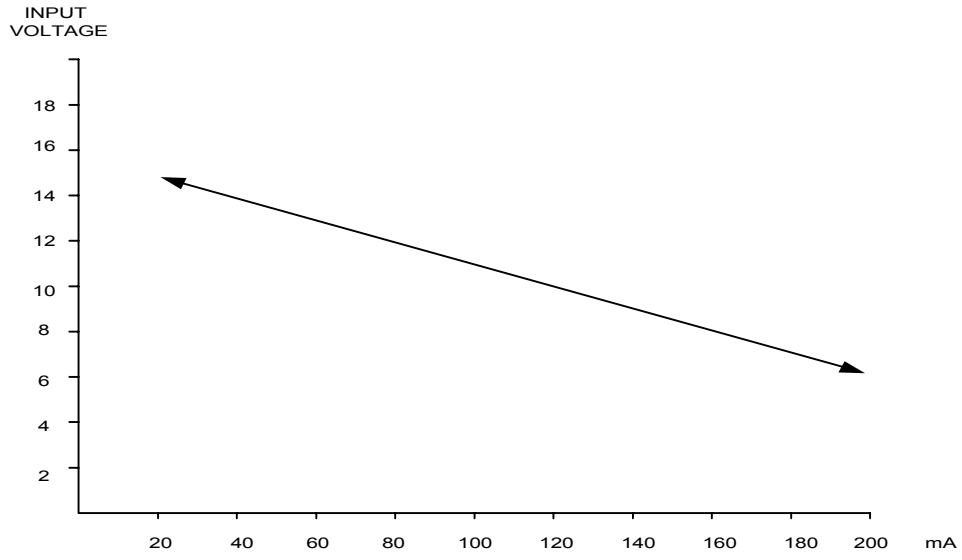
Table 9: MSG Module Mechanical Specifications

Module Length	< 3.0 inches
Module Width	1.4 +/- 0.05 inches
Module Height	< 0.5 inches
Module Weight	TBD oz.
Connector Pin Spacing	0.1 inch centers, unless otherwise specified
Connector Hole Dimension	0.038-inch diameter

Table 10: Environmental Specifications

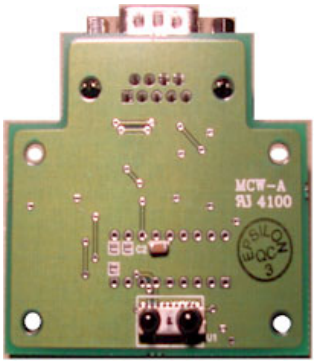
Operational Temperature	0°C - 70°C
Storage Temperature	-20°C - 85°C
Shelf Life	20 years (EEPROM retention)
Power Supply	+6Vdc to +9Vdc, ~5 mA not including the LCD Module current requirements

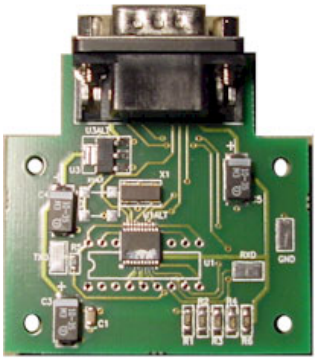
Graph 1: Current Limits for Back Lighting



Note: NOT staying within these stated limits for current will result in damage to the MSG2 and/or the LCD backlight.

IRDA DAUGHTER BOARD (OPTIONAL)



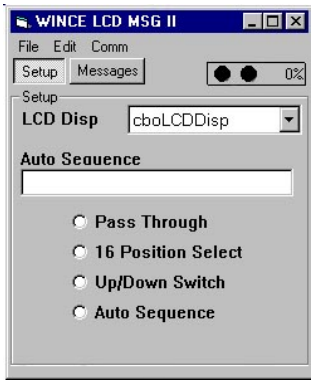


Front **Back**

The IRDA board connects to J5 on the MSG2 using an interface cable (optional). Connection should only be made **before power is applied**. Mount the IRDA board such that the optics module faces toward the laptop or handheld device, preferably through an IR-transparent protective cover. Maximum line-of-sight communication distance is 1 meter.

The IR interface can be used for configuration and message downloading. It does not support Pass-Thru mode or the downloading of firmware updates.

Software Display GUI for palm Windows CE 2.0 device.



Board Layout